Crafty Marketing: An Evaluation of Distinctive Criteria for “Craft” Beer

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Abstract

There is increasing consumer demand for craft beer, and for clarification of its definition in the face of widespread (mis)marketing. In recent years many small scale and independent breweries have been purchased by large brewing organisations vying to get a share of the growing and profitable niche market in craft beer. This raises the question of whether the beer produced by such breweries can still be defined as “craft”. Are there other factors that should be taken into consideration when defining genuine craft breweries? From the perspective of a consumer who seeks a craft product, little is known about how and where the beer is produced, and when labels are taken at face value there is a greater responsibility for retailers to distinguish between craft and mainstream beers. In this paper we explore the conceptual and practical aspects of defining craft beer, with reference to definitions established by various national industry associations.

Key Words: *Breweries, Microbreweries, Authenticity, Ales, Provenance, Sustainable Sourcing*

1. Introduction

1.1 Consumer perceptions of craft beer

Craft beer is often perceived by the consumer to originate from small and independent breweries that produce small batches of beer using the highest quality raw ingredients employing traditional brewing processes to produce an end product that is of superior quality in terms of distinctive taste and aroma (Kleaban and Nickerson, 2012; Gómez-Corona, Escalona-Buendía, *et al.*, 2016). This is important given that the growth of the craft sector is down to consumer demand for a unique experience that may not be offered by beer produced by multinational organisations (Gatrell, Reid and Steiger, 2018). Studies have shown that consumers apply a higher sense of value to an organisation that is seen to be “authentic” (Kovács, Carroll and Lehman, 2013) as opposed to “industrial”. Consumers’ ability to distinguish between a craft and non-craft beer is often limited to

information displayed on the product label, and there are no clearly defined boundaries between mass-produced and craft beer. Market research by Mintel found that 44% of consumers would like a credible system of certifying craft beer (Mintel, 2017). As previously suggested, brewery size alone may not be a reliable indicator of craft beer, as there are a multitude of other factors that may differentiate craft beer from generic beer. In essence and generally speaking a craft product is considered to be of superior quality, to be handmade and often produced in small quantities (Fillis, 2004). The crafts person is often trained on site by an experienced master crafts person with some time spent at college learning the academic principles (Gamble, 2001). Sennett states that "all craftsmanship is founded on skill developed to a high degree" and further notes that all forms of crafts are highly advanced skills developed over upwards of ten thousand hours of experience, as an individual's skill develops their abilities become more "problem attuned" and able to make decisions on how to overcome more complex tasks – unlike the untrained individual who may struggle with basic tasks (Sennett, 2008). Rice (2016) discusses the "revolutionary" nature of craft beer that should be distinguished by the characteristics of "small" and "authentic", in contrast to "generic" industrialised brewing processes. The authors go on to highlight the coexistence of both "authentic" craft and the "inauthentic" crafty (Rice, 2016). It is also possible to find beer at the local supermarket that is branded as own brand and described to fit in to the craft range.

The growing consumer demand for craft beer has not gone unnoticed by the leading global beer brands. Alcohol consumption in the UK has been steadily declining since 2004, and multinationals and established regional breweries are attempting to gain access in to the growing craft sector by either releasing beers described as craft beer or acquiring already established breweries such as Meantime and Camden Town brewery (Davies, 2015; Farrell, 2015). The growing trend of multinational organisations taking over independent breweries in order to sell craft beer has been coined as "craft washing" in recent work (Howard, 2017; Wallace, 2019). The lack of clarity on the term craft beer has left this industry segment open for the large scale breweries to produce new

beer ranges that may be craft in name only, and that may not be produced using the traditional methods associated with a traditional craft brewery (Rice, 2016).

1.2 Existing definitions of "craft"

The Brewers Association in the United States (USA) have taken the approach of defining craft beer as being sourced from a craft brewery that is verified as such by successfully meeting a set of pre-defined criteria. The Brewers Association is a not-for-profit organisation that represents small and independent breweries in the USA (Brewers Association, 2019). Their definition of a craft brewery is based on three characteristics (Brewers Association, 2018b): (i) having an annual production up to 7,040,867 hl or 6 million beer barrels (US); (ii) no more than 25% of the business is owned by another "beverage alcohol industry member"; (iii) possessing a "TTB Brewers Notice" and produces beer as opposed to contracting this to a third party. Breweries that meet all three criteria can freely use the Brewers Association seal mark on their labels. To date, 4818 breweries in the USA use the seal to promote their beer, over 85% of members (Brewers Association, 2018c). The Society of Independent Brewers (SIBA) who represent brewers in Britain have also created a seal mark similar to the Brewers Association in the USA. To qualify for SIBA's seal, Brewers must meet two characteristics (SIBA, 2018): (i) compliance with SIBA's food safety and quality standard; (ii) the brewery is an independent brewery with no affiliation with another larger brewing organisation. Eight hundred and seventy breweries currently use this seal, (SIBA, 2018). In contrast, 2378 breweries qualified for reduced duty, namely the small brewers relief, by having an annual production capacity under 60,000hl in 2018 (Brewers of Europe, 2018). Thus, many small breweries are not covered by the main industry seal for small and independent brewers, and it is fair to say that the brewing industry is not as well represented as the USA. Meanwhile, the Italian government has recognised the importance of the Italian craft beer sector and have taken a proactive approach to protect the credibility of the craft market by passing a Law in July 2016 defining what can be classified and thus sold as craft beer. This Law stipulates craft beer should originate from a small

brewery with an annual production of no more than 200,000 hl, that is operating independently of any other brewery, and must not subject the beer to pasteurisation or filtration (Centinaio, 2016). In this paper we critically evaluate criteria proposed by various industry associations and others to define craft beer and select a relevant subset of these criteria that could be practically applied by consumers or industry organisations to accurately differentiate craft beers.

2. Methodology

The aim of this paper is to explore whether objective criteria can be applied to define the term "craft" beer by evaluating various characteristics proposed by industry associations, academic and grey literature and discussions and viewpoints of independent brewing organisations in the UK. We begin with the broader meaning of the term "craft". What is a craft, how does one become a crafts person (and how long would this journey take)? We then critically evaluate craft definitions proposed by established industry associations in the USA and Britain. We conclude by proposing a short-list of criteria that could be objectively assessed to define craft beers.

2.1. The value chain of beer

Many factors influence consumer perceptions on what is a "craft" beer such as local embeddedness (Argent, 2018) sensory characteristics (Gómez-Corona, Escalona-Buendía, *et al.*, 2016; Gómez-Corona, Lelievre-Desmas, *et al.*, 2016) and aspects relating to place making (Fletchall, 2016). We do not address all of those factors in this paper, but focus on more technical criteria that could be used to objectively define craft beer and underpin a verifiable label. To do this, it is first necessary to consider the life cycle of beer production. The beer value chain has been described in Figure 1 by dividing the stages of beer production in to four steps. Firstly, cultivation of the raw ingredients includes all inputs (e.g. fertilisers), maintenance and harvesting operations prior to produce leaving the farm gate (Kok *et al.*, 2018). This stage applies to any grown ingredients used in brewing, including hops, barley and adjuncts such as wheat, rye and oats among many others. The second stage covers the onward processing of the ingredients (Henderson and Miller, 1972). In the case of

barley this would involve allowing the barley to partially germinate followed by a period of time in a kiln to roast the malt, depending on the type of malted barley being made (The Maltsters Association of Great Britain, 2019). Following processing, ingredients would then be packaged and prepared for delivery to a brewery. Stage three of the value chain includes all activities at the brewery from goods arriving, through brewing processes, to the final products being packaged for delivery. The brewing process itself consists of three initial stages (Gillespie and Deutschman, 2010). Beginning with mashing where the barley and adjuncts are mixed with water and left to stand for approximately one hour in a vessel called mashtun. Next the liquid is drained from the mashtun and additional hot liquor is poured over the content of the mashtun to ensure any remaining fermentable sugars are captured in a process called sparging. The liquid is transferred to a vessel traditionally known as the copper or boil kettle. During the boil, hops are included to add bitterness and aroma to the beer. The final stage of beer production starts with rapidly cooling the liquid from the kettle in preparation for fermentation where yeast is added. The beer will remain in a fermenter vessel – for ale this could be for between 7 and 10 days but for lager it can take a few weeks. Once fermented the beer is stored in vessels for maturation then placed in kegs, casks, bottles or aluminium cans ready to be distributed. The final stage in the value chain covers distribution from the brewery to retailers. This is separated in to two sectors known as on- and off- trade; the former represents pubs, clubs and restaurants and the latter shops and supermarkets.

Figure 1 Beer value chain

Growing, cultivating & harvesting raw ingredients 	Traditionally, barley has been the main source of fermentable sugar used to produce beer together with a number of adjuncts such as wheat, oats and rye. They are included for qualities such as flavour, mouth feel and head retention. These are included in the early stage of brewing known as the mash. In the boiling stage of the brewing process the hops are added these add flavour and aroma (Kok *et al.*, 2018).
Malting, drying & packaging 	For the purpose of this discussion the second stage of the value chain is from the farm gate, through the subsequent processing and packaging of major ingredients in preparation for use in the brewing process. Barley is processed by malting, which includes stimulating the barley to partially germinate before being heated in a kiln. The length of time in the kiln can result in a range of colour from light to dark beer. Other processes include drying of the hops, which is done to retain qualities such as colour, shatter, aroma, moisture content and alpha acidity (Henderson and Miller, 1972).
Brewing 	This involves milling the barley to brake open the husk, then mixing with other adjuncts depending on style and recipe in the mashtun which is soaked in water at 68 C for a period upwards of 60 minutes. The mashtun is then drained of all liquid, and to ensure all fermentable sugars are extracted from the mashtun a process named spagring is employed, involving spraying hot water over the content of the mashtun. The extracted liquid is named wort and is transferred to a vessel named a kettle for rigorous boiling again for a period upwards of 60 minutes, with hops added at different intervals. Once complete the wort is transferred to a fermentation vessel where yeast is added. A fermentation can take upwards of 7 days depending on style of beer. Once fermented the beer is stored in a maturation vessel before it is packaged in to either keg, cask, bottle or can ready for distribution. Once matured, beer can be pasteurised or filtered, though this is not carried out at all breweries.
Distribution & retail 	Once packaged the beer is ready for distribution, beer sales are split in to two sectors, firstly on trade meaning pubs, clubs and restaurants who sell beer in cask, keg, bottle or can and the off trade such as food and drinks retailers like supermarkets selling only bottles and cans.

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2.2. Criteria identification

First, a comprehensive list of possible defining criteria was created. Possible criteria were collated by firstly taking reference of industry association seals, as mentioned above, to establish criteria in current use (Brewers Association, 2018c; SIBA, 2018). This was followed by an extensive literature search of peer reviewed articles and grey literature using search words such as “craft”, “beer” and “brewing” (Bastian *et al.*, 1999; Fillis, 2004; Thurnell-Read, 2014; Elzinga, Tremblay and Tremblay, 2015; Fastigi *et al.*, 2015; Wells, 2016; Frake, 2016; Gómez-Corona, Escalona-Buendía, *et al.*, 2016; Rice, 2016; Howard, 2017; Gatrell, Reid and Steiger, 2018). There has been some work in recent years on consumer perception (Gómez-Corona, Lelievre-Desmas, *et al*, 2016; Gómez-Corona *et al*, 2017), but we look to the industry and producers for their perspectives, including recent discussions in the brewing industry about independence and ownership disseminated on social media platforms such as Facebook, Twitter and Instagram by many brewing organisations. Three social network sites have been selected to gain the viewpoints of breweries on the matter of multinational brewing organisation ownership of “independent” breweries: Facebook, Twitter and Instagram accounts of 76 breweries were followed. The methodology used for tracking discussion was social media opinion mining (SMOM) a qualitative approach observing viewpoints expressed on social media posts. Previous studies have utilised Application Program Interface to follow social media discussions on topics of interest (Rahmani *et al.*, 2014). This was considered unsuitable as the results would include public discussion. We observe the discussions, in this case the reaction to the news that a London based independent brewery had received an investment by a multinational brewing organisation in exchange for a share ownership in the business. The case study selected was a beer festival with a global attendance of over 70 breweries organised by the brewery in question. The approach taken in this case was to follow the accounts of the attending breweries.

3. Outcome

Following the comprehensive literature search it was possible to identify a total of six specific factors that were highlighted as having a place in the overall discussion over craft and non-craft. Each criteria was categorised as either an excluding or indicative criteria. Excluding criteria reflect an activity or characteristic that is considered to preclude a beer from being defined as craft, whilst indicative criteria represent factors that have been accepted by the sector as relevant but could not be used to disprove or confirm any craft identity. The six criteria are summarised in Table 1.

Table 1. Shortlist of six criteria considered for craft definition

Source	Criteria 1	Criteria 2
Industry Association	Size	Ownership
Brewing Industry	Ingredients	High Gravity Dilution
Observation	Automation	Creativity & Innovation

3.1 Brewery size

Perhaps the logical starting point in the definition of craft beer would be to consider the first defining criterion applied by the industry associations. Firstly, in order to avoid any confusion, it is important to distinguish between the terms microbrewery and craft brewery. A microbrewery is defined by size alone, falling below a certain output threshold, and may fall within the definition of a craft brewery subject to other defining characteristics being met. According to the Brewers association in the USA, a microbrewery has an annual production of up to 17,600 hl (Brewers Association, 2018a) and according to their website there are 4,247 microbreweries in the USA at present (Brewers Association, 2018d). As a defining criteria for a craft brewery, the Brewers Association have a maximum annual company production threshold of 7,040,866 hl. The Brewers of Europe classify microbreweries to be significantly smaller than the USA Brewers Association definition, with an annual production up to 1000 hl (Brewers of Europe, 2017). The brewing industry

in the UK has no description of a microbrewery, but the UK Government allow tax benefits for smaller breweries in the form of a small breweries relief. This is a tiered system allowing a 50% tax reduction for the smallest producers of up to 5000hl per year, with allocated benefits applied to larger breweries up to a maximum annual production of 60,000 hl. In recent years, many small scale and independent breweries have been purchased by multinational brewing organisations (Furnari, 2011; Davies, 2015; Farrell, 2015; Hancock, 2018).

The larger annual capacity threshold for craft breweries in the USA is likely to reflect the generally larger scale of brewing nationally compared with other countries. Specifying a maximum size for breweries producing craft beer may be somewhat arbitrary given that beer produced by large breweries could have many other qualities associated with craft beer. One example of this is the Scottish brewery BrewDog who reported total beer sales of 436,994 hl in their 2017 brand overview report (BrewDog, 2017). We will elaborate below important characteristics of BrewDog beers that could define them as craft, despite the relatively large size of this brewer.

3.2 Process control and production methods

Process control via automation is playing an essential role in all aspects of plant operation at large scale industrial food and drink production (Dahm and Mathur, 1990). This technology enables autonomous production and monitoring of production plant but the outcome can erode human responsibilities, and traditional human tasks may be substituted by automated machinery. Human input may be confined to observation and monitoring of the process through a Human Machine Interface (HMI) or control room (Wu *et al.*, 2016). Such modernisation of industrial production has seen many human tasks replaced by computerised control systems. This is not to say that automation does not have a place in a craft brewery. A modern bottling or canning plant for example relies on automated control, and the advancing technology in terms of instrumentation can provide a brewer with better control of the brewing and fermentation processes, ensuring the quality of the final beer (Chakraborty, Roy and De, 2015). There are valid arguments for utilising such

technology in small scale production given the financial constraints faced by small producers with a limited workforce. This matter is explored further in terms of both the benefits of such technology and the potential conflicts with the concept of craft brewing.

The advantage of utilising automated technology is that allows for continuous monitoring of specific parameters, thus ensuring that output is of the highest food quality standards. Plant down time can also be reduced as equipment can be taken off line or isolated as part of the control and monitoring – this feature prevents damage occurring to the equipment, for example pumps running dry, and improves the overall economic efficiency (Livelli, 2012). Automation can also result in less produce being wasted, by taking simple mundane tasks away from human control and reducing human error. Water consumption is a factor that can be dramatically reduced by installing equipment that measures usage, enabling better management (Laughman, 2017).

However a possible knock-on effect of employing such technology is the simplification of tasks and transfer of responsibilities away from humans, leading to the possible de-skilling of workers and ultimately reduction of staff numbers, though this is unlikely to be the case for a team at a small brewery. Traditional techniques and practices that are learnt and developed by experienced crafts people during a lifetime career could become redundant or unnecessary as tasks are taken over by automation in the overall brewing process at modern day breweries. The skills acquired by traditional brewers are of great importance for “occupational identity” (Thurnell-Read, 2014), and are needed for the formulation of new beers. There is a risk that specialist brewing skills may not be passed on to the next generation of craft brewers if reduced demand for these skills means that there is little scope for training. When used in combination with automation, the skills of a craftsperson may still be applied in the brewing process in a manner compatible with “craftsmanship”. However, when data collected by monitoring devices are fed in to a Programmable Logic Controller (PLC) processor that then controls tasks such as controlling valves, temperatures,

levels within vessels and running pumps via pre-written software code, the role and specialist input of the craftsperson diminishes, potentially creating a valid exclusion criterion for craft beer.

3.3 High gravity dilution

As discussed in the beer value chain, high gravity dilution is undertaken by some breweries after the fermentation stage. By measuring the original gravity from a sample of wort taken before the yeast is added and then measuring the beer when fermentation has finished it is possible to calculate the alcohol by volume (ABV) of the beer (Ferguson, 2016). Beer styles such as Belgian tripel, imperial stout and barley wine are all examples of high gravity beer with alcohol content ranging from around 8 - 11% ABV or higher (Ferguson, 2016; Poelmans and Taylor, 2019). With high gravity dilution, the higher alcohol content can be diluted with deoxygenised water, resulting in an increased volume of the final beer at 11.5°Plato. It has been found that increasing the fermentation temperature to 18°C can enable a high gravity wort of 22 °Plato to ferment within the same time as a wort of 15 °Plato. Diluting down a 22°Plato wort can increase brewing capacity by 91%, whilst diluting down a 15°P wort can increase brewing capacity by 30%, compared with aiming for a wort of 11.5°P (Lima *et al.*, 2011).

This procedure clearly has numerous economic and potential environmental benefits for industrial brewing, including reduced capital costs, energy and water inputs per litre of beer produced. However, this process does have some disadvantages including a reported decrease in “brew house material efficiency”, a reduction in hop utilisation and has a negative effect on the head retention (Cooper, Stewart and Bryce, 1998; Stewart, 2007). This process has previously been discussed among craft brewers as one that could not be associated with craft brewing, given their focus is on exploring new flavours (Watt and Dickie, 2013). For this assessment high gravity brewing is included as an exclusion criterion however it must be noted that at present not all beer labels contain details on the original specific gravity.

3.4 Independent ownership

248 The steady growth and subsequent industrialisation of large scale brewing has resulted in a small
249 number of multinational organisations retaining a large proportion of the beer sales market (Elzinga,
250 Tremblay and Tremblay, 2015; Fastigi *et al.*, 2015; Wells, 2016). Over the past decade multinational
251 breweries have taken aggressive measures to gain an advantage over their competitors to achieve a
252 greater proportion of the market share. The most high profile example was the acquisition of SAB
253 Miller by AB Inbev in a deal said to be worth £79bn making this the third largest merger in corporate
254 history leading to ABI being the largest brewing company in the world (Daneshkhu, 2016; Nurin,
255 2016). A growing trend within the craft sector has appeared where independent breweries are taken
256 over by multinational organisations. Meantime brewery was taken over by SAB Miller in 2015 and
257 later that year Camden Town Brewery was purchased by AB Inbev (Davies, 2015; Farrell, 2015).

Case study of Beavertown announcement of share sale to Heineken

On June the 21st 2018 Beavertown brewery announced on their social media accounts that they had sold a "minority" share to Heineken at a sum of £40 Million to fund the expansion plans including a new brewery in London to be called Beaver World. The explanation given for taking this action was that it was the only viable option to meet the growing needs of the business. After considering the other available options such as crowd funding, private equity and investment from other brewing organisations it was decided that no other funding program could meet the needs of the brewery given that the site in London was at maximum capacity and much of their beer was brewed under contract in Belgium. Therefore, the company required an immediate solution to meet the growing needs of the business. The Beavertown Extravaganza is a celebration of craft beer originally hosted at the Tottenham brewery in 2016. The event was moved to a much larger venue for 2017 in order to accommodate an expected footfall of 8000 people over the course of the weekend. The 2018 Beavertown extravaganza was a sell-out event with 90 breweries from all over the world in attendance (Craft & Slice, 2018); a showcase of some of the world's most popular craft beer brands actively collaborating. Few other events in the UK include such a diverse line up. Following Beavertown Brewery's investment announcement, reaction from the brewing community was largely negative and potentially damaging for the future of the Beavertown Extravaganza. The reaction began with the announcement by Cloudwater a brewery located in Manchester and an active collaborator with many craft breweries in the UK and overseas. They announced on their social media accounts that they had withdrawn from the 2018 event. This was followed by announcements from Buxton brewery, Brew by Numbers and Verdant in the UK with breweries like Dry and Bitter in Denmark and Jester King in the USA also following suit. Many breweries subsequently withdrew from the event and from monitoring the social media accounts of Beavertown. Over the following weeks, from the original line up of 90 breweries, 41 breweries had withdrawn from event.
This case study highlights the importance of ownership as an essential criterion of craft beer. This could also be interpreted as a form of self-regulation amongst the networks of craft breweries showing how independent breweries negatively view any association with big beer.

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Recent studies led by Gomez-Corona categorised the beer industry as two sectors: craft and industrial (Gómez-Corona, Escalona-Buendía, *et al.*, 2016; Gómez-Corona *et al.*, 2017). It could be interpreted that based on this description beer not produced using industrial production methods would necessarily be craft beer, and vice versa. Further consideration suggests that accurate classification of craft beer is more nuanced than this. For example, a brewery employing small scale manual production processes cannot be defined as craft if under the ownership of a multinational organisation according to other existing criteria. Share ownership is acceptable in the USA up to 25% for craft definition (Brewers Association, 2018b), but the Assured Independent campaign in the Britain stipulates total independence as a qualifying requirement (SIBA, 2018). The flexible approach of the Brewers Association allows a craft brewery to seek investment if retaining majority share and maintaining control of the business. This stance can allow a business to expand and access new markets. Here, we adopt the stance taken by the Brewers Association, and propose retaining a minimum 75% ownership of the business; a value above this would act as an excluding criteria (Brewers Association, 2018b).

3.5 Ingredients

The creation of unique flavours has been a key selling point of craft brewing (Bastian *et al.*, 1999). As previously discussed by Bogdan et al (2017) non-malted grains such as barley, corn, rice, wheat, oats and rye are known as solid or mash vessel adjuncts. The liquid or kettle adjuncts varieties include malt extract popular among home brewers and sugar syrups derived from sugar cane and sugar beet (Bogdan and Kordialik-Bogacka, 2017). A variety of beer styles can help differentiate breweries but also demonstrates an in depth understanding of various styles and brewing techniques required to produce e.g. sour beer or barrel aged beers. The use of high quality raw ingredients is expected to be an essential characteristic of craft beer and is often discussed as central to the ethos of many craft breweries (Kleaban and Nickerson, 2012). This point is often highlighted with breweries detailing the specific ingredients on the packaging and sometimes openly sharing the recipes for their beers. For

example BrewDog have published the “DIY Dog” – a collection of all beer recipes from the entire BrewDog range for home brewing replication (Watt and Dickie, 2018). In addition to providing the home brewer with an opportunity to reproduce recipes, this also has an additional advantage of showing complete transparency with the ingredients used. There has been some speculation over the type and quality of raw ingredients used in beer produced by multinational breweries, with barley being substituted with other lower-cost fermentable ingredients such as rice and maize (Poreda *et al.*, 2014). The basis for this is reported to be to produce a beer that is lighter in colour and supposedly flavour (Stika, 2017). However there is also significant suspicion that such substitutions may be more financially motivated rather than driven by quality and flavour objectives (Watt and Dickie, 2013). For example, sucrose based syrups are used to produce a higher gravity wort at lower cost than barley malts, often as the preliminary step to high gravity dilution as discussed in section 3.3 with the aim to increase the capacity of the brewhouse rather than to improve flavour (Bogdan and Kordialik-Bogacka, 2017). In contrast, craft brewers may advertise their ingredients to promote a beer, and this practise is often seen when breweries collaborate to produce a one-off beer (Omnipollo, 2018; Brewdog, 2019). The style of beer and ingredients are often announced on social media platforms as a low-cost but powerful method to promote their product (Figure 2). A recent Instagram post from a Danish brewery named Mikkeller shared what they claim to be the first collaboration with a brewery from Bhutan using an unusual ingredient combination including pineapples and Himalayan pink salt. This can be seen as an example of a modern day brewery responding to the growing demand by the consumer for transparency and the desire to know more about where the food comes from, and that it is produce safely and sustainably (Beulens *et al.*, 2005; Wognum *et al.*, 2011; Mangla *et al.*, 2018).

Figure 2: Mikkeller collaboration with Namgay Artisanal Brewery (Namgay Artisinal Brewery, 2018)

3.6 Creativity and innovation

One factor that is not so regularly discussed when defining craft beers is the diversity of choice on offer to consumers. The evolution of big brewing has resulted in mass production of a limited number of brands, potentially leaving the consumer with a few choices of beer. The majority of beer produced by the big organisations is lager with a few ale or stout options. These are heavily marketed to the consumer in television advertisements and online, with some brands going a step further by associating beer with events, sports or pastimes (Vinjamuri, 2019). The BBPA reported that Lager is the most popular beer in the UK making up 74% of the total beer sales in 2016 (BBPA, 2016). On the other hand in terms of independent or small scale brewing there is an endless list of beer styles that is on offer to the consumer (Gatrell, Reid and Steiger, 2018). Craft breweries have the agility to make one off, experimental or seasonal beer and later decide if a new beer should be added to a core range based on consumer feedback. This is an important characteristic of many craft breweries. However, it is the choice of the individual brewery as to whether they produce an ever changing range of beer by experimenting with different styles and ingredients or simply focus on a core range and do it well. This is considered to be a reliable metric to establish whether a brewery is

craft or not as it is an important indicator that could be readily used to inform consumers about the craft nature of a brewery.

The following table includes the characteristics found to be associated with craft beer together with a short description. Some characteristics have previously been identified as essential factors and are thus considered to be exclusion criteria. If a single exclusion criteria is found for a particular beer or brewery where it is brewed, the craft identity is negated.

Table 2 Craft beer characteristics – Full list

Characteristic	Description
1. Size	A maximum annual production no more than 200,000hl
2. Automation	The overall process governed by human control with automation supporting the human decision
3. High Gravity Dilution	Producing wort with a higher original gravity then diluting the alcohol content.
4. Ownership	The brewery must retain 75% ownership of the business.
5. Ingredients	The use of adjuncts for the purpose of enhancing the overall flavour and experience not substituting ingredients to reduce the cost of production.
6. Creativity and Innovation	A range of core and seasonal beer, a variety of various beer styles e.g. Sour beer or barrel ageing

4 Discussion

This assessment has taken the approach of reviewing the current literature and viewpoint of prominent brewers within the UK brewing industry that have been outspoken about the topic of craft beer and established industry associations to define craft beers. This exercise has highlighted that the term “craft beer” is far more complex and difficult to accurately define than previously postulated by consumers, industry stakeholders and academics (Gómez-Corona *et al.*, 2017). From this, a conclusion is made on a subset of the relevant criteria that can be used to define craft beers from the full list in Table 3 and these criteria are evaluated below. The proposed shortlisted criteria could be used by industry associations to verify a brewery’s compliance, e.g. in order to qualify for the use of a “craft” seal mark. Proposed criteria could also be employed by the retail industry, particularly supermarkets, to allocate shelf spacing for a “genuine craft beer range” or even to edit

out craft “imposters” from their assortment (e.g. to demonstrate commitment to provenance and sustainability). Some characteristics have previously been identified as essential factors and could be used in this case as exclusion criteria. If a characteristic from table 3 is appointed as exclusion criteria it could be viewed the beer and brewery in question fall outside the definition and therefore the craft identity would be negated. The UK has been revaluating its relationship with the EU and an important point to consider is that the UK is the foremost importer of beer from elsewhere within the EU (Brewers of Europe, 2017). Figure 3 shows a process diagram to assist in the determination of whether a beer can be categorised as craft or not. This exercise is designed to exclude beer that is non craft by answering three questions.

Figure 3: Flow diagram to assess craft beer based on pertinent criteria proposed in this study

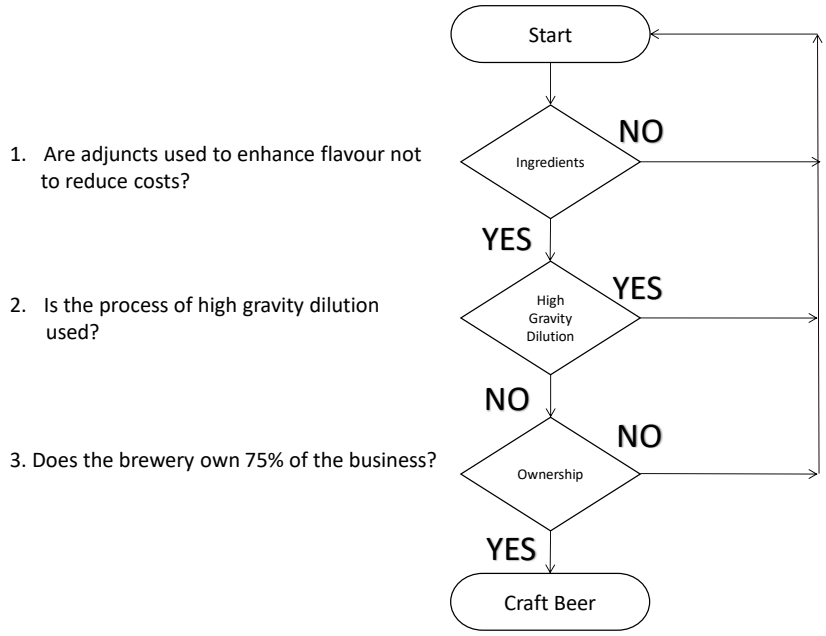

Table 3: Conclusions on criteria pertaining to the definition of craft beer

Characteristic	Description	Appropriate-ness	Concluding Comments
1. Size	A maximum annual production no more than 200,000hl.	Indicative Criteria	Size criteria should be removed as an excluding criteria and observed as an indicative criteria.
2. Automation	The overall process is governed by human control with automation supporting human decision making by (a) craft person(s).	Indicative Criteria	Impractical. Could be used as a defining criterion but would require brewery inspections, and boundaries of automation and human control fuzzy.
3. High Gravity Dilution	Producing wort with a higher specific gravity than the final beer, and diluting down to produce the final product.	Excluding Criteria	This is a useful exclusion criterion that indicates decision making driven by cost rather than flavour beer
4. Ownership	The brewery must retain 75% ownership of the business.	Excluding Criteria	A useful metric and simple to gather evidence
5. Ingredients	Adjuncts are selected for the purpose of enhancing the overall flavour and experience, not simply to reduce the cost of production.	Excluding Criteria	An important criterion that is central to the craft brewing ethos
6. Creativity and Innovation	The brewery produces a diverse and evolving range of core and seasonal beers, including a variety of beer styles (e.g. sour beer or barrel aged beer).	Indicative Criteria	A useful criterion to indicate craft brewing

4.1 Production size

The annual production of a brewery has been included by industry associations. It is a factor that will undoubtedly provoke disagreement. After reviewing the literature this criterion we propose that there is no evidence to support any specific threshold, and therefore conclude that **this criterion should be withdrawn entirely to place emphasis on other important defining criteria**.

4.2 Automation

The hands on process of brewing is an intrinsic aspect of craft beer that attracts consumers (Rice, 2016). As for other artisan products, there is a need to define this desirable quality. Producing beer using a fully automated control system, as one would expect to see at a modern brewery, means that the craft person is somewhat disconnected from the produce he or she creates. It would be foolish for a brewery to decide not to utilise modern instrumentation for the benefit of efficiency, to

reduce wastage and maintain quality. A modern facility can still be viewed as craft brewery providing that human decision making is the overall controlling factor throughout the brewing process. As with many small businesses often employing a limited workforce, the use of technology can be essential for the smooth running. One observed example of this had a single person running the business. This brewer was not in a position to employ any workers, but instead used instrumentation to monitor the fermentation process remotely, allowing the business owner to spend more time at home with family and enabling a healthier work life balance. This factor valued as a way of informing the consumer how the beer is produced but this is not considered suitable as a excluding criteria.

4.3 High gravity dilution

This process has potential financial benefits for mass production but this is a polar opposite focuses of craft brewing and this has been discussed as having an effect on qualities such as head retention (Stewart, 2007). Given that members from the craft beer industry have also expressed a negative view of this process we propose this should be used as an exclusion criteria (Watt and Dickie, 2013). It is the breweries decision what information to print on the label and original specific gravity is not always shown. For this to be a possible criteria a certification scheme would need to verify this regulated by a governing body.

4.4 Ownership

It is very important to take in to consideration the ownership when questioning whether a brewery is craft or not. The negative views held by independent breweries have been discussed earlier in regards to accepting investment from multinational brewing organisation and the inflexible attitude towards any collaboration with a recipient of such investment. Whilst investment from a third party being either a larger brewery or investment company can enable a business to grow and potentially access new markets there is also a sense of suspicion by consumers surrounding outright ownership given that the investors ability to influence production and accounting amongst other things, this might have an effect on the quality of the final product (Frake, 2016). It is wise to set an ownership

limit for the craft brewery to continue operations as normal but equally important to enable growth through investment there for it would be wise to adopt the stance taken by the Brewers Association with a 25% ceiling on investment.

4.5 Ingredients

The central point that should have no compromise is the quality of the raw ingredients going into a craft beer, because taste, provenance and authenticity are key characteristics attributed to craft beer by consumers (Gómez-Corona, Lelievre-Desmas, *et al.*, 2016). The use of high quality raw ingredients and the use of adjuncts to enhance the overall beer experience and not to reduce costs should be viewed as a core criterion. This point is set to safeguard quality and maintain a distinction from mainstream mass-produced beer. Sugar syrup is an example of an adjunct used primarily to enhance alcohol yield rather than deliver distinct flavour, and as such, when used as a primary adjunct, can be readily identified as an exclusion criteria for craft definition. There may be some ambiguity over other low-cost adjuncts such as maize and rice, but the onus rests on the brewer to demonstrate that such ingredients contribute to a distinctive flavour. Some brewers already share specific information on their websites, but this key information would be more appropriately shared at the point of sale, with packaging appealing to both the proactive retailers and consumers. It is also important to understand the view of brewers who feel that sharing such information could affect their competitive advantage, and to navigate this matter it may be necessary for a certification body to take control of this and to confidentially check compliance on all matters and to provide a system as simple as a tick box to show the successful achievement of all criteria.

4.6 Creativity and innovation

This could be used as a defining criterion and as previously discussed the craft producers have the ability to experiment and make new beers as limited release before incorporating to a core range. This also could be a requirement for meeting the craft definition if it was adopted by an industry association and complying with this could simply require the creation of new beer's annually. This

ensures that the skills of the crafts person are continually developed and encouraged to express themselves with new ingredients.

5 Limitations of the study

It must be noted that some criteria do have limitations surrounding the availability of information regarding specific activities has been difficult to obtain from a desk top analysis. The subject of ownership is often publicly reported in newspaper articles and social media platforms when a company is acquired and this has been found to be the simplest criteria to verify. The original specific gravity is sometimes shared, this is quite simple information to include on packaging but without this voluntarily being available high gravity dilution is difficult to clarify. This is another reason for a governing body to take responsibility over a certification scheme. Although it has no overall effect on the definition, it is believed that indicative criteria should be available to the consumers to understand how the beer is made in order to facilitate an informed decision.

6 Conclusion

To ensure quality and maintain credibility it stands to reason that a craft beer can only come from a genuine craft brewery. However, there are no universally accepted definitions of what a craft beer or craft brewery is. In this paper, we critically explore existing definitions and propose a set of universally applicable criteria to rigorously distinguish craft beer. It might be easier to define what craft beer isn't rather than what it is, as it is such a contentious subject. Any attempt to define craft beer such as our will inevitably provoke debate and come under some scrutiny. Craft beer is certainly not mass produced and it is difficult to associate craft beer with multinational brewing and the organisations who produce mainstream beer. Craft beer is perceived as "honest" and uncompromising in terms of flavour, but may be either traditional or modern. Craft beer is made using traditional brewing processes and uses the best quality raw ingredients with adjuncts included to enhance the flavour and experience not to reduce cost.

7 Recommendation

It is recommended that to safeguard the true quality and identity of craft beer, an independent and autonomous industry board or organisation is required to check individual compliance with a set of objective criteria, such as those proposed in this paper. Broad acceptance of criteria for "craft" definition by the sector would require intensive stakeholder consultation by the prospective validating organisation, with a clear mandate to ensure that criteria remain meaningful and verifiable. Whilst greater transparency of ingredients and brewing processes is required, ideally though labelling, this must be balanced with the need to maintain a degree of confidentiality around proprietary processes. An opt-in labelling scheme could be based on voluntary sharing of such information, which in itself may be a useful indication of craft credentials.

References

Argent, N. (2018) 'Heading down to the local? Australian rural development and the evolving spatiality of the craft beer sector', *Journal of Rural Studies*. doi: 10.1016/j.jrurstud.2017.01.016.

Bastian, C. T. *et al.* (1999) 'Niche Market Potential: The Case of the U.S. Craft Brewing Industry', *Review of Agricultural Economics*. doi: 10.2307/1349898.

BBPA (2016) *The Statistical Handbook 2016*. Edited by British Beer and Pub Association.

Beulens, A. J. M. *et al.* (2005) 'Food safety and transparency in food chains and networks. Relationships and challenges', *Food Control*. doi: 10.1016/j.foodcont.2003.10.010.

Bogdan, P. and Kordialik-Bogacka, E. (2017) 'Alternatives to malt in brewing', *Trends in Food Science and Technology*. Elsevier Ltd, pp. 1–9. doi: 10.1016/j.tifs.2017.05.001.

Brewdog (2019) *BrewDog vs Northern Monk - Tokyo Death*. Available at: https://www.brewdog.com/brewdog-vs-northern-monk-tokyo-death (Accessed: 12 February 2019).

BrewDog (2017) *Brand Overview*. Available at: http://448f59f74df57015bbb8-a9447b7dfa4ae38e337b359963d557c4.r88.cf3.rackcdn.com/BrewDog Equity for Punks V deck.pdf.

Brewers Association (2018a) *Craft Beer Industry Market Segments*. Available at: https://www.brewersassociation.org/statistics/market-segments/ (Accessed: 19 October 2018).

Brewers Association (2018b) *Craft Brewer Defined*. Available at: https://www.brewersassociation.org/statistics/craft-brewer-defined/ (Accessed: 19 February 2018).

Brewers Association (2018c) *Defend Independance*. Available at: https://www.brewersassociation.org/business-tools/marketing-advertising/independent-craft-brewer-seal/ (Accessed: 15 November 2018).

Brewers Association (2018d) *United States Breweries*. Available at: https://www.brewersassociation.org/directories/breweries/?type=micro&term=United

States&searchby=country (Accessed: 19 October 2018).

Brewers Association (2019) *Brewers Association*. Available at: https://www.brewersassociation.org/.

Brewers of Europe (2017) *Beer Statistics 2017 Edition*. doi: 10.1002/0471684228.egp13486.

Brewers of Europe (2018) *Beer Statistics 2018*. Available at: https://brewersofeurope.org/uploads/mycms-files/documents/publications/2018/EU-beer-statistics-2018-web.pdf.

Centinaio, G. M. (2016) *Chapter V PROVISIONS ON THE PRODUCTION OF ARTISAN BEER*. Italy: unionalimentari. Available at: http://www.unionalimentari.com/en/ultimora-alimentare/legge-2872016-n154-estratto-art35-e-36--birra-artigianale-e-filiera-luppolo.aspx.

Chakraborty, K., Roy, I. and De, P. (2015) 'Controlling Process of a Bottling Plant using PLC and SCADA', *Indonesian Journal of Electrical Engineering and Informatics*, 3(1), pp. 39–44. Available at: http://section.iaesonline.com/index.php/IJEEI/article/viewFile/125/pdf.

Cooper, D. J., Stewart, G. G. and Bryce, J. H. (1998) 'Some reasons why high gravity brewing has a negative effect on head retention', *Journal of the Institute of Brewing*. doi: 10.1002/j.2050-0416.1998.tb00979.x.

Craft & Slice (2018) *Beavertown Extravaganza 2018 – Brewery List Released*, *Craft & Slice*. Available at: https://craftandslice.com/beer/beer-news/beavertown-extravaganza-2018-brewery-list-released/.

Dahm, M. and Mathur, A. (1990) 'Automation in the food processing industry: distributed control systems', *Food Control*, 1(1), pp. 32–35. Available at: https://www.sciencedirect.com/science/article/pii/095671359090118V.

Daneshkhu, S. (2016) 'Shareholders back AB InBev and SABMiller £79bn "Megabrew" deal', *Financial Times*, 28 September. Available at: https://www.ft.com/content/925d4c1e-84f7-11e6-a29c-6e7d9515ad15.

Davies, R. (2015) 'Camden Town Brewery sold to world's biggest drinks company', *The Guardian*, 21 December. Available at: https://www.theguardian.com/business/2015/dec/21/camden-town-brewery-sold-inbev-worlds-biggest-drinks-company.

Elzinga, K. G., Tremblay, C. H. and Tremblay, V. J. (2015) 'Craft Beer in the United States: History, Numbers, and Geography', *Journal of Wine Economics*. doi: 10.1017/jwe.2015.22.

Farrell, S. (2015) 'SAB Miller buys Meantime to enter UK craft beer market', *The Guardian*, 15 May. Available at: https://www.theguardian.com/business/2015/may/15/sab-miller-buys-meantime-to-enter-uk-craft-beer-market.

Fastigi, M. *et al.* (2015) 'The irresistible rise of the craft brewing sector in Italy : can we explain it?', in *4th AIEAA Conference – Innovation, productivity and growth. 11-12 June 2015*.

Ferguson, E. (2016) *Craft Brew*. 1st edn. Edited by Z. Alkayat. London: Frances Lincoln.

Fillis, I. (2004) 'The Internationalizing Smaller Craft Firm: Insights from the Marketing/Entrepreneurship Interface', *International Small Business Journal*. doi: 10.1177/0266242604039481.

Fletchall, A. M. (2016) 'Place-Making Through Beer-Drinking: A Case Studies of Montana's Craft Breweries', *Geographical Review*. doi: 10.1111/j.1931-0846.2016.12184.x.

Frake, J. (2016) 'Selling Out: The Inauthentic Discount in the Craft Beer Industry', *Institute of*

519 *Operations Research and the Management Science*, 63(11). Available at:
520 https://pubsonline.informs.org/doi/abs/10.1287/mnsc.2016.2517.

521 Furnari, C. (2011) 'Goose Island Acquired By Anheuser-Busch', *brewbound*, 28 March. Available at:
522 https://www.brewbound.com/news/update-goose-island-acquired-by-anheuser-busch-2.

523 Gamble, J. (2001) 'Modelling the Invisible : the pedagog y of craft apprenticesh', *Studies in*
524 *Continuing Eductaion*, 23(2). Available at:
525 https://www.researchgate.net/profile/Jeanne_Gamble/publication/240524773_Modelling_the_Invi
526 sible_The_pedagogy_of_craft_apprenticeship/links/59d648800f7e9b42a6a9f980/Modelling-the-
527 Invisible-The-pedagogy-of-craft-apprenticeship.pdf.

528 Gatrell, J., Reid, N. and Steiger, T. L. (2018) 'Branding spaces: Place, region, sustainability and the
529 American craft beer industry', *Applied Geography*. doi: 10.1016/j.apgeog.2017.02.012.

530 Gillespie, B. and Deutschman, W. A. (2010) 'Brewing Beer in the Laboratory: Grain Amylases and
531 Yeast's Sweet Tooth', *Journal of Chemical Education*. doi: 10.1021/ed100442b.

532 Gómez-Corona, C., Lelievre-Desmas, M., *et al.* (2016) 'Craft beer representation amongst men in two
533 different cultures', *Food Quality and Preference*. doi: 10.1016/j.foodqual.2016.05.010.

534 Gómez-Corona, C., Escalona-Buendía, H. B., *et al.* (2016) 'Craft vs. industrial: Habits, attitudes and
535 motivations towards beer consumption in Mexico', *Appetite*. doi: 10.1016/j.appet.2015.10.002.

536 Gómez-Corona, C. *et al.* (2017) 'The building blocks of drinking experience across men and women: A
537 case study with craft and industrial beers', *Appetite*. doi: 10.1016/j.appet.2017.05.026.

538 Hancock, E. (2018) 'Beavertown confirms £40 million stake sale to Heineken', *The Drinks Business*, 21
539 June. Available at: https://www.thedrinksbusiness.com/2018/06/beavertown-confirms-40-million-
540 stake-sale-to-heineken/.

541 Henderson, S. M. and Miller, G. E. (1972) 'Hop drying—Unique problems and some solutions',
542 *Journal of Agricultural Engineering Research*. The British Society for Research in Agricultural
543 Engineering, 17(3), pp. 281–287. doi: 10.1016/S0021-8634(72)80032-5.

544 Howard, P. (2017) 'Craftwashing in the U.S. Beer Industry', *Beverages*. doi:
545 10.3390/beverages4010001.

546 Kleaban, J. and Nickerson, I. (2012) 'TO BREW, OR NOT TO BREW—THAT IS THE QUESTION: AN
547 ANALYSIS OF COMPETITIVE FORCES IN THE CRAFT BREW INDUSTRY', *JOURNAL OF THE*
548 *INTERNATIONAL ACADEMY FOR CASE STUDIES*, 18(3), p. 59. Available at:
549 https://www.abacademies.org/articles/jiacsvol18no32012.pdf#page=69.

550 Kok, Y. J. *et al.* (2018) 'Brewing with malted barley or raw barley: what makes the difference in the
551 processes?', *Applied Microbiology and Biotechnology*. doi: 10.1007/s00253-018-9537-9.

552 Kovács, B., Carroll, G. R. and Lehman, D. W. (2013) 'Authenticity and Consumer Value Ratings:
553 Empirical Tests from the Restaurant Domain.', *Organisation Science*, 25(2), pp. 458–478. Available
554 at:
555 https://www.researchgate.net/profile/Balazs_Kovacs8/publication/266077864_Authenticity_and_C
556 onsumer_Value_Ratings_Empirical_Tests_from_the_Restaurant_Domain/links/55fcfa3f08aeafc8ac5
557 2f75f.pdf.

558 Laughman, C. (2017) 'Water, water everywhere, including the bottom line', (November). Available
559 at: https://search-proquest-
560 com.ezproxy.bangor.ac.uk/docview/2094362621/fulltext/184B806BA1564EDDPQ/1?accountid=148
561 74.

562 Lima, L. *et al.* (2011) 'Comparing the impact of environmental factors during very high gravity
563 brewing fermentations', *Journal of the Institute of Brewing*. doi: 10.1002/j.2050-
564 0416.2011.tb00480.x.

565 Livelli, G. (2012) 'Improving Productivity & Accuracies While Reducing Downtime', *Power*
566 *Engineering*, 116(7), p. 68. Available at: https://search-proquest-
567 com.ezproxy.bangor.ac.uk/docview/1038459220?accountid=14874.

568 Mangla, S. K. *et al.* (2018) 'Enablers to implement sustainable initiatives in agri-food supply chains',
569 *International Journal of Production Economics*. doi: 10.1016/j.ijpe.2018.07.012.

570 Mintel (2017) *Beer - UK - December 2017 Defining Craft Beer*.

571 Namgay Artisinal Brewery (2018) *Pinapple Gose With Himalayan Pink Salt*, *Facebook*. Available at:
572 https://www.facebook.com/NABparo/photos/a.619581351548110/1030211807151727/?type=3&th
573 eater (Accessed: 2 December 2018).

574 Nurin, T. (2016) 'It's Final: AB InBev Closes On Deal To Buy SABMiller', *Forbes*, 10 October. Available
575 at: https://www.forbes.com/sites/taranurin/2016/10/10/its-final-ab-inbev-closes-on-deal-to-buy-
576 sabmiller/#46896ff8432c.

577 Omnipollo (2018) *Yellow Belly 2017*. Available at: https://omnipollo.com/products/yellow-belly
578 (Accessed: 12 February 2018).

579 Poelmans, E. and Taylor, J. E. (2019) 'Belgium's historic beer diversity: Should we raise a pint to
580 institutions?', *Journal of Institutional Economics*. doi: 10.1017/S1744137419000080.

581 Poreda, A. *et al.* (2014) 'Corn grist adjunct - application and influence on the brewing process and
582 beer quality', *Journal of the Institute of Brewing*. doi: 10.1002/jib.115.

583 Rahmani, A. *et al.* (2014) 'Social media analysis and summarization for opinion mining: a business
584 case study', *Social Network Analysis and Mining*. doi: 10.1007/s13278-014-0171-y.

585 Rice, J. (2016) 'Professional Purity: Revolutionary Writing in the Craft Beer Industry', *Journal of*
586 *Business and Technical Communication*. doi: 10.1177/1050651915620234.

587 Sennett, R. (2008) *The craftsman*, *The Craftsman*.

588 SIBA (2018) *Assured Independant British Craft Brewers*, *SIBA*. Available at:
589 http://www.indiecraftbrewers.co.uk/ (Accessed: 22 February 2018).

590 Stewart, G. G. (2007) 'High gravity brewing – the pros and cons', *New Food Magazine*, March.
591 Available at: https://www.newfoodmagazine.com/article/1550/high-gravity-brewing-the-pros-and-
592 cons/.

593 Stika, J. (2017) 'Brewing with corn', *Brew Your Own*, December. Available at:
594 https://byo.com/article/brewing-with-corn/ (Accessed: 21 March 2019).

595 The Maltsters Association of Great Britain (2019) *Malt - Unravelling the Mystery*. Available at:
596 http://www.ukmalt.com/malt-unravelling-mystery (Accessed: 18 March 2019).

597 Thurnell-Read, T. (2014) 'Craft, tangibility and affect at work in the microbrewery', *Emotion, Space*
598 *and Society*. doi: 10.1016/j.emospa.2014.03.001.

599 Vinjamuri, D. (2019) 'Bud Light's Super Bowl Ad: Corn Syrup, Ethics and Mistaken Identity', *Forbes*, 6
600 February. Available at: https://www.forbes.com/sites/davidvinjamuri/2019/02/06/bud-lights-super-
601 bowl-ad-corn-syrup-ethics-and-mistaken-identity/#757e6ee63a39.

602 Wallace, A. (2019) '"Brewing the Truth": Craft Beer, Class and Place in Contemporary London',

603 *Sociology*. SAGE Publications Ltd, 53(5), pp. 951–966. doi: 10.1177/0038038519833913.

604 Watt, J. and Dickie, M. (2013) *Defining Craft Beer*, *Brew Dog*. Available at:
605 https://www.brewdog.com/blog/defining-craft-beer.

606 Watt, J. and Dickie, M. (2018) *DIY DOG 2018 - The Brew Dog Back Catalogue*. 1st edn. Brew Dog.
607 Available at: https://www.brewdog.com/diydog.

608 Wells, P. (2016) 'Economies of Scale Versus Small Is Beautiful', *Organization & Environment*. doi:
609 10.1177/1086026615590882.

610 Wognum, P. M. *et al.* (2011) 'Systems for sustainability and transparency of food supply chains -
611 Current status and challenges', *Advanced Engineering Informatics*. doi: 10.1016/j.aei.2010.06.001.

612 Wu, L. *et al.* (2016) 'Influence of information overload on operator's user experience of human–
613 machine interface in LED manufacturing systems', *Cognition, Technology and Work*. doi:
614 10.1007/s10111-015-0352-0.

615

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617